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## What do MOOCs contribute to the debate on learning design of online courses?

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Learning design in MOOCs seems to follow particular approaches, as the claim is that the MOOC target audience, a 'massive' student body, will require different learning designs from those that work for small student numbers. For instance, 'traditional' online courses have a small in size target audience, whereas the MOOC is usually free, offers no accreditation and targets large (massive) audiences. Because, anyone with an Internet connection can enrol, academic staff cannot possibly offer personalised, one-to-one support to students. Consequently, learning design to support self-regulated learning is a significant consideration.

To address these issues, MOOC platform developers have looked at how the learning design of the format could scaffold learning in the MOOC space and encourage network formation between more participants to support each other. To achieve this some of the MOOC platforms dictate a more or less rigid template of a learning design, whereas other providers leave the design of the courses up to the individual customer institutions, within broad guidelines. Wherever the MOOC 'experiment' takes us, there is still an optimism that results will leave behind a digital trail of good practice to (a) show more clearly what a truly self-regulated learning environment might look like and (b) benefit other forms of formal and/or informal forms of instruction in higher education.

The paper explores the learning design characteristics of MOOCs, and particularly those elements that are essential for independent learning and student support. It assesses whether these are implicit or explicit in the design of MOOCs, and how they are embedded in the MOOC platform. It then explores the value of design patterns as an approach to solving the particular design challenges raised in the paper. Overall, it seems that the premise that guides several debates on how MOOCs work is that we should be spending more time when we design MOOCs to enhance those features that support the self-regulated learner.

### 1. Introduction

Massive Open Online Courses (MOOCs) have become a major focus of perceived innovation in online learning. Wikipedia (2015) defines a MOOC as "an online course aimed at unlimited participation and open access via the web ... this is possible only if the course is open, and works significantly better if the course is large; the course is not a gathering, but rather a way of connecting distributed instructors and learners across a common topic or field of discourse".

The major innovations in MOOCs are not their learning design elements of limited or no access to academic staff, peer interaction, social media, fora, and automated assessment. These have been used elsewhere for years to support student learning in more 'conventional' online learning environments. The MOOC may share some of the conventions of an ordinary course, such as a predefined timeline and weekly topics for consideration, a space for communication and self assessment activities. However, it is the massive audience that dictates some of the teaching strategies and learning design features. The connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources are essential features in the MOOC environment. Perhaps most importantly, however, a MOOC builds on the active engagement of several hundred to several thousand "students" who self-organize their participation according to learning goals, prior knowledge and skills, and common interests.

What marks a MOOC out from conventional online learning is that no professional academic time (or virtually none) is allocated to guiding or supporting individual learners. This is probably the biggest difference between other forms of online learning and the element of support in MOOCs. Overall, it seems that the premise that guides several debates on how MOOCs work is: "should we be spending more time when we design MOOCs to enhance those features that support the self-regulated learner?"

This paper investigates the related literature and will highlight the key learning design features of MOOCs as they are discussed and evaluated in the literature. Liyanagunawardena et al (2013) refer to some of the MOOC literature as thinly disguised promotional material by commercial interests, and Daniel (2012) identifies a common trend in articles by practitioners whose perspective is their own MOOC courses. Our exploration assessed a collection of recent literature contributions on MOOCs and their learning design. In examining the relevant literature, we concluded that popular discourse in mainstream media and the Internet is still dominating the MOOC debates, rather than strong empirical evidence of impact on student learning.

## 2. MOOCs: Learning design features

Whether MOOCs represent a genuine innovation, or a reappearance and reorganisation of previous achievements in open, distance and online learning, is a significant theme in the academic literature. The paper intends to contribute to the debate by considering the learning design approaches and features in MOOCs and their perceived value based on evaluations and evidence from the literature.

## 3. Content and course material

The use of (pre-dominantly) pre-recorded or live non-interactive video-based lectures is most common in MOOC learning design, whereas the more conventional approach of text-based or multimedia-based content material is not frequently used. This has led to a re-evaluation of the perceived value of non-interactive video in online learning content, which had frequently received criticism as non appropriate use in educational practice (University of Tennessee, n.d).

Overall, MOOCs allow students alternative routes through material and they allow automated feedback however, as Daniel (2012) points out, they do not provide a sense of being treated as an individual. Personalised learning has been achieved before in online learning, but it requires gauging student prior knowledge, an understanding of an individual student's needs, intervention and presence in the form of discussion, feedback and encouragement. According to Daniel (ibid.), it is here that we find the greatest difference between the predominant xMOOC model and the earlier cMOOCs, the latter of which had a strong focus on online interaction. Whereas in a cMOOC environment, in which connectivism, a learning theory which explains how Internet technologies have created new opportunities for people to learn and share information (Siemens 2005), is the main influence, the participants embrace a cognitive approach, acting as both teachers and students, sharing information and engaging in a joint teaching and learning experience through intense interaction facilitated by technology (Haber, 2012), an xMOOC is characterised by a more or less prescriptive, behaviourist design (Yuan and Powel, 2013).

## 4. Connectivity (and connectivism): the influence of emergent technologies

Connectivity in MOOCs is usually provided through conventional computer mediated communication media such as discussion fora (mostly unmoderated or lightly moderated) and through social networking. Web and social media tools (such as wikis or blogs and social networking) are now as central to learning as the lecture theatre and campus infrastructure in a traditional university campus (Daniel, 2012). They take the form of discussions via fora, blogs, and microblogging (mainly, Twitter), Google+, and other forms of social media.

In such spaces, learners may have been compromised by lack of support and moderation, and this has led some researchers to recommend light touch moderation to prevent confusion, firmly intervene in cases of negative behaviour, and explicitly communicate what forms of unacceptable behaviour can impede learning in the network. However, the lesson drawn for learners is that some constraints may actually improve the learning experience. This reflects earlier debates in the literature about the requirements of interfaces designed to support learning (Fowler & Mayes, 1999).

Some findings (Scanlon et al in press 2015) on participants' use of social media tools indicate that a greater proportion of those completing a MOOC rate their knowledge and understanding of social media tools as moderate to expert compared to those who started the course. However, prior MOOC experience did not show a similar advantage. Blake & Scanlon (2013) suggest that 'this may be an indication that the suitability of present open and freely available tools for supporting large scale learning needs to be carefully considered.'

## 5. Vicarious learning

Collaborative creation of knowledge, the use of computer mediated communication and peer or self assessment are all staples of the MOOC design that support student learning, but there are other unintentional gains such as vicarious learning, occurring in the MOOC environment. Vicarious learning, drawing from the definition by Bandura (1986), refers to an instructional setup that occurs when students learn by watching another student at the front of the class interacting with the teacher. In the case of the MOOCs, it refers specifically to being involved in "seeing students guided to fumble their way towards sense-

making" (Haggard, 2013). This seems to be a non-negligible, probably unexpected gain of the MOOC participant that has serious implications for learning design. It points towards gains in the MOOC environment for independent learners, however so far is not tangible and easily replicated.

## 6. Badges

The role of badging is to enable micro-certification and make visible skills and competences that have been developed as students learn. A badge is a digital representation of a skill, learning achievement or experience. Badges can represent competencies and involvements that have been recognized in online or offline life. Each badge is associated with an image and relevant metadata. The metadata provide information about what the badge represents and the evidence used to support it. The badges can be awarded by a tutor or teaching assistant or administrator in a semi automated fashion for achievements such as multiple choice quiz completion, however some of the badges, particularly the peer awarded ones can play a truly motivational role in engaging learners. Learners can display their badges online and can share badge information through social networks, potentially outside the MOOC environment.

## 6. Who is the learner?

Active MOOC participants are considered those students who fully participate in the MOOC, for instance, 'consuming' content, taking quizzes and other forms of assessment, writing assignments and sharing artefacts and peer reviewing. Haggard (2013) identified four significant clusters of students in computer science MOOCs:

1. "Auditing" learners watch lectures throughout the course, but attempt very few assessments.
2. "Completing" learners attempt most of the assessments offered in the course.
3. "Disengaging" learners attempt assessments at the beginning of the course but then sometimes only watch lectures or disappear entirely from the course.
4. "Sampling" learners briefly explore the course by watching a few videos.

Despite the fact that such a taxonomy can lead to making unhelpful assumptions about the clientele of MOOCs and their learning behaviours, not dissimilar to the 'digital native' 'digital immigrant' paradigm, creating a distinction between learners who are "auditing", "sampling", "disengaging" and "completing" seems a sensible differentiation in how learners approach and interact with content, other learners and the MOOC environment.

### 7. Learning analytics

Evaluations of the MOOC environment focus on the registered learners' expectations from a course; analysis of participation rates; use of course resources, use of badges and collaborative group working (Scanlon, in press 2015). Data sources used for evaluation include a range of qualitative and quantitative tools: pre- and post-course surveys, discussion fora, social media contributions of participants, public spaces of the course and blogs created by the participants. Buckingham Shum and Ferguson (2012) emphasize the importance of social learning analytics in considering such experiences.

Learner analytics technology, already theorised and explored in a mature and established debate rooted in the Open and Distance Learning literature, comes to its full potential with the scale and mechanisation of MOOCs. Theoretically, learning analytics assessments helps to provide students more engaging material based on their individual profiles and learning behaviours. In this context, adaptive learning is claimed to be a real possibility and interventions can be targeted to secure completion and address low retention. Content trackers collect statistical data about traffic and aggregate the data into meaningful reports.

Analysis of course metrics can be used to improve learning design and achieve higher rates of completion. For example, learner analytics, show that improvements to course discussion fora in particular, a good predictor of completion, could boost retention rates.

### 8. Disruption and constructivist vs. instructivist approaches

A useful survey of the ways in which MOOCs may act as disruptive innovations (Lawton & Katsomitros, 2012) and its related data argue that the disruptive nature of the MOOC technology is not

found in one single innovation, but rather in the incremental effect of many changes in several areas of practice, from pedagogy to business model. This supports the view of the MOOC, not as a radical departure from the traditional open and distance learning environment, but as a learning space, where innovations are reusing older constructivist or behaviourist approaches in designing online courses. This allows evaluations that result in claims, positioning MOOCs in the constructivist-behaviourist scale. For instance, In MacLeod's judgment, the Edinburgh MOOCs (Bayne and Ross, 2014), although hosted on Coursera (2015) platforms, which favour an xMOOC, instructivist learning model, were closer to the cMOOCs of the original constructivist school.

### 9. Learner autonomy and independent learning

Online autonomy, group formation and inclusion/exclusion feelings among learners are a vital dynamic in MOOC learning, and are probably insufficiently understood (Daniel, 2012). To start with, it is also likely that primary and secondary education curricula are not addressing these learning skills adequately, resulting in prospective participants arriving unprepared at the MOOC 'gate'.

Mackness et al (2010) point out that participants value their autonomy in the MOOC, but do so at different levels depending upon language command, subject expertise, assessment for credit participation, personal learning styles and identity as well as the reputation of instructors and fellow participants.

Finally, the McAuley et al report (2010) identifies the main issues facing MOOCs as pedagogical and touches on independent learning triggers in the MOOC environment:

- deep learning: the extent to which they can support deep enquiry and the creation of sophisticated knowledge and the breadth versus the depth of participation;
- uptake: whether and under what conditions successful participation can extend beyond those with broadband access and sophisticated social networking skills;
- 'lurking': identifying the processes and practices that might encourage lurkers, or "legitimate peripheral participants", to take on more active and central roles;

- impact: value of even peripheral participation, specifically the extent to which it might contribute to participation in the digital economy in extra-MOOC practices;
- facilitating: specific strategies to maximise the effective contribution of facilitators in particular and more advanced participants in general;
- Assessment and accreditation: the role for accreditation, if any, and how it might be implemented.

### 10. Assessment

The ability to evaluate vast number of learners in MOOCs is a big challenge (Yin and Kawachi, 2013). As Yousef et al (2014) point out, assessment and related accreditation is an important factor for the future success of MOOC. They link the lack of systematic offerings of formal academic accreditation by most MOOC providers to issues around the quality of learning (Sandeem, 2013) or relevance of their MOOCs to traditional university courses (Sandeem, 2013). Currently, most MOOCs are only providing a non-credit certificate of completion, or attendance, or participation. In this context, beyond the standard e-assessment (e.g. the proliferation of multiple choice quizzes), peer assessment, and self assessment are significant innovations.

### 11. Peer assessment

Peer assessment has been used, predominantly in cMOOCs and less in xMOOCs to review student outputs: assignments, projects, individual and collaborative assignments. These assignments are not graded automatically by the MOOC engine, but learners themselves can evaluate and provide feedback on each other's work and O'Toole (2013) highlights the suitability and added value of this approach in disciplines, such as Humanities, Social Sciences and Business studies, which do not have clearly cut right or wrong answers and where automated assessment is more difficult to implement.

### 12. Self assessment

Self assessment offers benefits in engaging the learner in learn-how-to-learn activities and reflection on performance. Sandeen (2013) and Piech et al (2013) have identified some self

assessment techniques that include model answers as a tool to be used by students to cross check if their self assessment is in tune with model answers set by the educators, and where learners can self-reflect on their achievements (Yousef et al, 2014).

### 13. MOOCs: Expectations and impact

The chasm between expectations and reality has been discussed in the literature. A standard point of reference is a comparison to 'conventional' online courses. Research has differentiated between MOOCs and typical online courses not only in terms of class size, but also with respect to learning design of the course. Given the expectation of peer learning in MOOCs, a certain critical mass is necessary for any learning design features to be successful. For example, Siemens (2005) defined massive as anything that is large enough that you can get sub-clusters of self-organized interests; three hundred plus students could be one benchmark. Another could be Dunbar's number of 150 people (a suggested cognitive limit to the number of people with whom one can maintain stable social relationships), which is the maximum after which the group starts to create smaller fractions (ibid.). This numbers are vast in relation to the ideally sized online class of 20-25, hence the emphasis on any design approaches that achieve self regulation.

In general evaluation of MOOCs has included (Hollands & Tirthali, 2014):

- Pre- and post - assessment of skills and knowledge through formative assessment;
- Development of metrics to assess gain in cognitive and non-cognitive skills that can be applied outside of the MOOC environment;
- Comparison of skill or knowledge acquisition through MOOCs vs. regular online or face-to-face courses;
- Follow-up of post-MOOC outcomes such as sequential learning experiences or employment opportunities gained;
- Broadening the types of learners represented in studies of MOOC activity and impact in order to avoid the presentation of results that are not applicable to the majority of learners.

**Discussion: towards a design patterns approach to enrich the MOOC learning design vocabulary**



Overall, the findings of this exploration of the literature indicate (Table 1) that in terms of structure MOOCs plan learning activities which:

Are embedded structure-wise in a predefined timeline and include weekly topics/themes for consideration.
Are not based on prerequisites other than Internet access and interest, no predefined expectations for participation, and no formal accreditation.
Allow students alternative routes through the material.
Allow automated feedback and support automated assessment.
Do not provide a sense of being treated as an individual.
Do not usually assign professional academic/tutor time to guiding or supporting individual learners.
Enable students to be potentially served more engaging material based on their individual profiles using learner analytics technology.
Support the self-regulated learner.

Table 1. Learning activities in MOOCs.

Finally, computer mediated communication seems to be a major feature in MOOC learning design, even though designer intentions and learner uptake of related opportunities is commonly aspirational. In this respect, MOOCs plan learning activities (Table 2) which:

Support connectivity (usually provided through social networking).
Support co-creation, collaboration and peer interaction, or via discussion fora, blogs, wikis or other forms of social media.
Incorporate moderation (usually light touch) to support learners.

Table 2. Computer mediated communication in MOOCs.

Other important considerations seem to include supporting vicarious learning, i.e. guiding learners to fumble their way towards sense-making and providing some constraints that may improve the learning experience. Finally, table 3 aggregates the learning design features that may support independent learning.

MOOC learning design features
Non-interactive video-based lectures (predominantly) or other content
Computer mediated communication media

Wikis	Fora	Blogs and microblogging	Social networks
Badges: Tutor or peer awarded			
Learning analytics			
Adaptive Learning tools		Content trackers	
Assessment			
Automated	Peer assessment	Self assessment	

Table 3. A map of learning design features of MOOCs

## 14. Learning design in MOOCs and the patterns approach

Generating and sharing good practice in MOOC design seems to be as problematic as in more 'conventional' online learning, despite the open nature of the environments that offer glimpses of the learning design to educators and designers. If the intention should be for educators to engage in design, then methodologies that follow a design patterns approach will be valuable in articulating, validating and sharing design knowledge. In this section, a mapping is attempted between some of the learning design characteristics that were previously discussed against the set of patterns that were generated in a design patterns project that aimed to support the continued development of MOOCs (Warburton & Mor, 2015). In this mapping there has been a focus on the design solutions and good practice that the pattern methodology has generated and the support for self regulation the MOOC patterns offer (see table 4). The examination is intended to be complimentary to the emerging pattern language of shareable design solutions and validates the typology of MOOC design attributes. The informal language used in some of the offered solutions adds to the authenticity of the pattern methodology.

<p>Non-interactive video-based lectures or other content</p>	<ul style="list-style-type: none"> <li>• Do not expect students to be able to purposefully navigate excessive choice.</li> <li>• Allow different languages and group people accordingly.</li> <li>• Allow access to all materials at any time, online or offline.</li> <li>• Signal core and discretionary activities but do not restrict access.</li> <li>• Flexible assessment tracks.</li> <li>• Explicitly relate learning outcomes to pathways - by skipping [activity x] you will lose the opportunity to [outcome d and outcome f].</li> <li>• You could have a visible basic schedule, but the platform could signal opportunities in response to your individual work (but this depends on being online).</li> <li>• Give access the lecturer via online questions and up-voting.</li> <li>• Adjacent platforms (e.g. YouTube for video - these incidentally leave a MOOC legacy which bring attention beyond the lifespan of the MOOC).</li> </ul> <p>Reference pattern: <b>Crowd Bonding</b>, MOOC Design Patterns (2015) at <a href="http://www.moocdesign.cde.london.ac.uk/outputs/patterns">http://www.moocdesign.cde.london.ac.uk/outputs/patterns</a></p>	<p>Reference pattern: <b>Crowd Bonding</b>, MOOC Design Patterns (2015) at <a href="http://www.moocdesign.cde.london.ac.uk/outputs/patterns">http://www.moocdesign.cde.london.ac.uk/outputs/patterns</a></p>
<p>Computer mediated communication media (Fora)</p>	<ol style="list-style-type: none"> <li>1. Determine natural or desirable groupings, which might be sought for this learning topic. For example, if the topic is about computer programming, perhaps grouping learners based on their operating system will be more useful because they are likely to have similar problems in installing software and running it.</li> <li>2. Can be done by observing the nature of posts and posts seeking interaction in the opening days.</li> <li>3. Form forum threads or sub-forums, which are accessible to everyone on the front page of the forum.</li> <li>4. Those threads should be informatively titled according to the groups defined.</li> <li>5. Allow the learners to form additional threads as needed.</li> <li>6. Review for further weeks and phases of MOOC/ODL.</li> <li>7. This will prevent students being isolated in dying threads as other learners drop out. Students have access to other discussions and can link discussions from multiple groups depending on similar themes.</li> </ol>	<p>Computer mediated communication media (Wikis)</p> <p>Start the activity with an individual task to post an image (possibly accompanied by a short commentary) to a shared space such as a wiki. It is important that the wiki or similar collaboration tool is easily accessible from within the MOOC platform (ideally it will not require additional login) and will support the easy embedding of digital media (e.g. images, web links and videos). Then create a group task to identify another student's image from the wiki and begin a discussion thread based on it. Then structure the discussion by asking students to reply to another's initial posting by asking questions, providing a further example or contributing their own perspective on how the answer relates to the course content. This activity will encourage students to engage with others in a way that is easy and has immediate benefits. By encouraging students to create a resource together using digital media, the resulting collaborative product will be sufficiently stimulating to promote further learning.</p> <p>Reference pattern: <b>Sharing Wall</b>, MOOC Design Patterns (2015) at <a href="http://www.moocdesign.cde.london.ac.uk/outputs/patterns">http://www.moocdesign.cde.london.ac.uk/outputs/patterns</a></p> <p>Non-interactive video-based lectures or other content</p> <p>Induction to include learning journey, learning online (digital literacy), how to make the most of the platform. For example: FutureLearn provides a video on how to use the platform, how to orient around it. This generic video is good because if the learner is taking more than one MOOC from the same platform they need not repeat it. On the other hand, if the tutor wants to personalise the video for his/her course, this may be an opportunity to add 'teacher presence' and demonstrate the unique features of the course.</p> <p>Reference pattern: <b>Induction</b>, MOOC Design Patterns (2015) at <a href="http://www.moocdesign.cde.london.ac.uk/outputs/patterns">http://www.moocdesign.cde.london.ac.uk/outputs/patterns</a></p>



Learning analytics (tutor rather than system generated)	<p>Sketch out your key audiences and design a flexible approach working on your priority groupings. Build in multiple pathways where possible to ensure that more than one type of audience/learner background is catered for. Accept that you may not be able to cater for all who register. Work to create a good experience for your core audiences by asking yourself 'who' is this course for?</p> <p>Reference pattern: <b>Know your audiences</b>, MOOC Design Patterns (2015) at <a href="http://www.moocdesign.cde.london.ac.uk/outputs/patterns">http://www.moocdesign.cde.london.ac.uk/outputs/patterns</a></p>
Peer assessment	<p>Use peer assessment as an approach to help scale feedback on activities, to produce outputs that are assessable or reviewable, e.g. a case study, a report, etc.</p> <p>Reference pattern: <b>Enabling peer feedback</b>, at ILDE (Integrated Learning Design Platform): <a href="http://ilde.upf.edu/moocs/">http://ilde.upf.edu/moocs/</a></p>

Table 4. Example mapping of MOOC design patterns to design solutions

## 15. Conclusion: Do MOOCs innovate pedagogy?

The paper explored the learning design characteristics of MOOCs, and particularly those elements that are essential for independent learning and student support. It assessed whether these are implicit or explicit in the design of MOOCs, and how they are embedded in the MOOC platform. It then explored the value of design patterns as an approach to solving the particular design challenges raised in the paper. According to Daniel (2012), there is an opportunity to exploit the consensus that MOOCs drive innovation in learning by employing the digital toolset in learning, which has finally come of age.

Overall, it seems that the premise that guides several debates on how MOOCs innovate is that we should be spending more time when we design MOOCs to enhance those features that support the self-regulated learner. This makes approaches as the use of pattern language in MOOCs (Mor et al, 2012) significant as a tool for understanding the design processes and mechanisms by which we come to create and deliver open online learning at scale.

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